AIR POLLUTION

When It Comes to Electric Vehicle Emissions, Location Matters

Electric vehicle emissions derive not from gasoline or diesel but from coal and other energy sources used to power the electricity grid.

In an effort to boost sales the Chinese government recently announced it would waive the 10% sales tax on domestic electric cars on top of government subsidies totaling up to $19,000 per car.[1] But despite their green reputation, on a per-kilometer basis electric cars in China cause over 3.5 times more air pollution–related premature deaths than gasoline-powered cars, according to new estimates calculated for the country's 34 largest cities.[2]

In the study, the researchers calculated emissions per person-km traveled—that is, a person traveling 1 km in a vehicle (if 15 people travel 10 km in a bus, the bus accumulates 150 person-km). They considered five vehicle types: electric cars (not including hybrids), electric bicycles and scooters (e-bikes), gasoline cars, diesel cars, and diesel buses. They estimated tailpipe emissions for gasoline and diesel vehicles based on emissions standards and figures published in the peer-reviewed literature. Electric vehicles do not produce combustion emissions themselves; instead, their emissions impact comes from the power plants that produce the electricity they use. The vast majority of electricity in China is coal-fired[2] (compared with slightly less than 50% in the United States[3]).

The authors modeled the fraction of fine particulate matter ($PM_{2.5}$) emissions inhaled by the population to estimate total attributable excess mortality. "This is the pollutant with the most well-studied health impacts, including irrefutable association with premature mortality," says coauthor Christopher R. Cherry, an assistant professor in the University of Tennessee–Knoxville Department of Civil and Environmental Engineering.

Although vehicle-specific mortality varied greatly from city to city, electric cars were estimated to cause more premature deaths than gasoline cars in 33 of the 34 cities surveyed.[2] "Emissions from coal-fired power plants are comparatively high in China because of lower-quality coal and fewer plants using emission-control technologies," explains report coauthor Julian D. Marshall, an assistant professor of environmental engineering at the University of Minnesota, Minneapolis.

In Shanghai, for instance, power-plant emissions associated with electric cars caused an estimated 26 excess deaths annually per 10 billion person-km versus 9 excess deaths for gasoline cars. Diesel

The Beat | by Erin E. Dooley

FDA Delays Enforcement of New Sunscreen Labels

When the U.S. FDA announced new rules for sunscreen labeling in June 2011, manufacturers were given a year to comply.[1] In May 2012 the agency announced a six-month delay in enforcement to give manufacturers extra time to retool labels and complete broad-spectrum testing for their products.[2] Under the new regulations, sunscreen products including cosmetics and moisturizers must back up labeling claims with testing to ensure they deliver the promised amount of protection. Only products with an SPF higher than 15 can claim they reduce risks of skin cancer and early aging, and labels may no longer use the vague and unsubstantiated terms "waterproof" and "sweatproof," but instead must state how long products offer water-resistant protection.

Revised sunscreen labeling has been delayed one more summer.

New Device Provides Better Pollutant Dose Estimates

New personal exposure monitoring devices may allow investigators to better predict an individual's particulate matter (PM) exposure and ventilation, measurements that can be used to more accurately estimate the dosage of pollutants a person receives in real time.[3] Testing showed that the integrated accelerometers used in the devices accurately predicted how much PM was inhaled by adult volunteers during several typical daily activities. The devices could improve efforts to link environmental exposures with health outcomes, especially those that develop over a relatively short time, such as cardiopulmonary diseases.

Cleaner Coastal Water after 40 Years

Researchers at the University of Southern California are studying changes in levels of trace metals in water since the Clean Water Act was established in 1972. The team compared data for water samples collected near numerous effluent outfalls off the Southern California coast in 1976 with samples they collected in the same locations in 2009.[4] Although levels of trace metals were still elevated, they report dramatic decreases since 1976, with one site showing decreases of about 400-fold for copper and cadmium, about 100-fold for lead, about 50-fold for nickel, and about 10-fold for zinc and barium. The researchers noted the decreases came about even though the population of the region has increased, a shift of almost 13% just since the 1990 census.

E. coli Detectives

Investigators have long sought quicker, more sensitive means to detect *Escherichia coli* in recreational waters, food, and beverages.

cars caused an estimated 90 excess deaths per 10 billion person-km. Diesel buses, which have lower emissions per person-km than diesel cars because they carry more people, caused an estimated 32 excess deaths, and e-bikes performed the best, causing only 3 estimated excess deaths per 10 billion person-km per year.

Not surprisingly, the implications of this research for other countries are variable. Vietnam, for example, depends much more on natural gas and hydropower than coal for its electric power, says Cherry, such that electric cars there cause one-third as much pollution as gasoline cars and one-tenth as much pollution overall as they do in China. Conversely, he says, in India, average power-sector emissions of $PM_{2.5}$ are 10% greater than in China, causing more pollution per kilometer per electric car.

"It is important to remember that electric vehicles are only as clean as the electricity that charges them, and a clean energy future includes both electric vehicles and a cleaner electricity grid," says Don Anair, a senior analyst and engineer at the Union of Concerned Scientists (UCS). Anair notes that the U.S. grid is cleaner than China's as a result of clean-air regulations and increased investment in renewable electricity (the U.S. investment in renewable energy ranks second in the world, just behind China[4]). The emissions intensity of the U.S. grid—that is, the emissions per unit of power produced—will continue to improve as older, unimproved coal-fired plants are retired, he says.

Beijing exempts battery-electric vehicles from its monthly license-plate lottery to determine who is allowed to buy a new car. In March 2011 nearly 400,000 people vied for the monthly allotment of 17,600 license plates.[6] In another effort to reduce traffic emissions, the city also occasionally uses odd/even rationing based on license plate number to control the number of cars on the road.[7]

A report from the UCS released in April 2012 found that even in the U.S. region with the most emissions-intensive electricity grid, greenhouse-gas emissions attributable to electric vehicles are equivalent to those produced by gasoline cars that get 31–40 miles per gallon.[5] That report did not address mortality attributable to $PM_{2.5}$ exposure.

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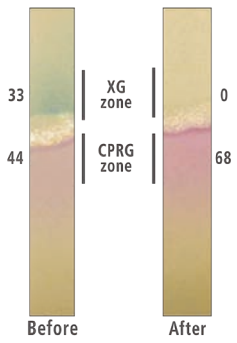

The chemicals XG and CPRG detect pathogenic *E. coli* using immunomagnetic separation.

Results of preliminary testing suggest a new bioactive paper strip coated with sol–gel entrapped reagents may be the ticket.[5] Within 30 mins of sampling, the strip changes color to indicate concentrations of *E. coli* and whether the bacteria are pathogenic or nonpathogenic. Field tests of the strips are already under way, and the product could be market-ready in as soon as two years.

Biomass Fires a Major Source of Isocyanic Acid

Researchers first measured isocyanic acid (HNCO) in the atmosphere in summer 2010.[6] Results of a new modeling study indicate that HNCO may be a significant air pollutant in areas of the world where forest fires and other biomass burning are common.[7] The results indicate that for weeks at a time HNCO levels in regions including Africa, Southeast Asia, Siberia, and the Western Amazon Basin may reach concentrations more than 10 times the levels expected to cause adverse health effects. HNCO exposure has been linked to cataract formation and inflammation contributing to cardiovascular disease and rheumatoid arthritis.

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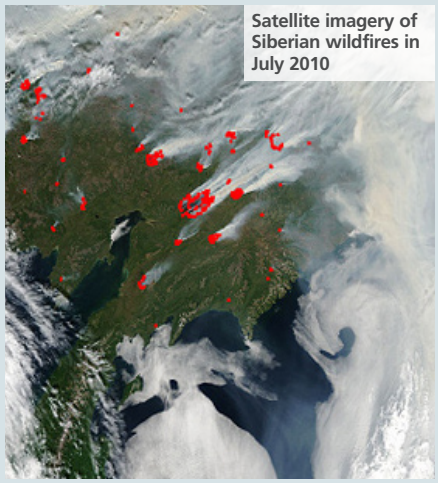

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